B Methodological and Technical Notes

A. County Definitions

1. Overview

Data from several different sources were used in this publication, and one of our chief methodological concerns was ensuring comparability of county definitions across datasets. We used the Federal Information Processing Standard (FIPS) codes to link county definitions across datasets, and to reconcile differences. For the majority of states, there was 100 percent comparability in county definitions among all the datasets used. Details about modifications to county definitions for specific states appear below.

The following cities were retained as independent cities and the FIPS codes were modified to conform to the geographic database.

Independent City	Original FIPS Code	Modified FIPS Code	State
Baltimore City	24510	24007	Maryland
St. Louis City	29510	29191	Missouri
Carson City	32510	32025	Nevada
Suffolk City	51800	51123	Virginia

2. Alaska

In the Area Resource File (ARF), Alaska was treated as a single geographic unit. The ARF did not provide data for the Alaska county equivalents. Therefore, for each of the maps that present data from the ARF, we were unable to map data for Alaska. These maps include the following:

Total Population per Cardiovascular Disease (CVD) Physician, 1990
Total Population per Cardiac Intensive Care Unit (CCU) Bed, 1993
Cardiac Rehabilitation Units, 1993
Local Economic Resources, 1990

Due to differences in county coding over time, and differential coding among the various data sources, several other changes were also made to county FIPS codes. The coding changes are indicated in the following tables.

Original County	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code	State
Aleutian Islands East	2013	Aleutian Islands	2010	Alaska
Aleutian Islands West	2016	Aleutian Islands	2010	Alaska
Denali Borough	2068	Yukon-Koyukuk	2290	Alaska
Kobuk	2140	Yukon-Koyukuk	2290	Alaska
Skagway-Hoonah-Angoon	2232	Skagway-Yakutat-Angoon	2231	Alaska
Yakutat	2282	Skagway-Yakutat-Angoon	2231	Alaska

3. Arizona

Original County	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPSCode	State
Yuma	4027	LaPaz	4012	Arizona

4. Hawaii

Original County	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code	State
Kalawao	15005	Maui	15009	Hawaii

5. Virginia

Virginia is comprised of counties and independent cities that are treated as county-equivalents in many datasets. However, not all of the datasets we used contained data for the Virginia independent cities. Many of these cities are also difficult to represent on a map because of their small land area. Therefore, the spatial geometry for most of Virginia independent cities was removed from the geographic database and data for those cities was collapsed into those counties with which they are most geographically associated. We followed the conventions of the 1996 Area Resource File. The changes made to FIPS codes to combine Virginia independent cities with their surrounding or adjacent counties are shown in the table below.

Independent City	Independent City FIPS Code	Incorporated into Adjacent County	Modified FIPSCode	State
Bedford	51515	Bedford	51019	Virginia
Bristol	51520	Washington	51191	Virginia
Buena Vista	51530	Rockbridge	51163	Virginia
Charlottesville	51540	Albemarle	51003	Virginia
Clifton Forge	51560	Allegheny	51005	Virginia
Colonial Heights	51570	Chesterfield	51041	Virginia
Covington	51580	Allegheny	51005	Virginia
Danville	51590	Pittsylvania	51143	Virginia
Emporia	51595	Greensville	51081	Virginia
Fairfax	51600	Fairfax	51059	Virginia
Falls Church	51610	Fairfax	51059	Virginia
Franklin	51620	South Hampton	51175	Virginia
Fredericksburg	51630	Spotaylvania	51177	Virginia
Galax	51640	Grayson	51077	Virginia
Harrisonburg	51660	Rockingham	51165	Virginia
Hopewell	51670	Prince George	51149	Virginia
Lexington	51678	Rockbridge	51163	Virginia
Lynchburg	51680	Campbell	51031	Virginia
Manassas	51683	Prince William	51153	Virginia

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Independent City	Independent City FIPS Code	Incorporated into Adjacent County	Modified FIPS Code	State
Manassas Park	51685	Prince William	51153	Virginia
Martinsville	51690	Henry	51089	Virginia
Norfolk	51710	Norfolk	51129	Virginia
Norton	51720	Wise	51195	Virginia
Petersburg	51730	Dinwiddie	51053	Virginia
Portsmouth	51740	Norfolk	51129	Virginia
Radford	51750	Montgomery	51121	Virginia
Richmond	51760	Henrico	51087	Virginia
Roanoke	51770	Roanoke	51161	Virginia
Salem	51775	Roanoke	51161	Virginia
South Boston	51780	Halifax	51083	Virginia
Staunton	51790	Augusta	51015	Virginia
Waynesboro	51820	Augusta	51015	Virginia
Williamsburg	51830	James City	51095	Virginia
Winchester	51840	Frederick	51069	Virginia

5. Yellowstone National Park

Original County	Original County FIPS Code	Incorporated into Adjacent County	Modified FIPS Code	State
Yellowstone National Park (Part)	30113	Park	30067	Montana

B. Data Sources

1. Economic Resources Data

Data for the Index of Local Economic Resources were obtained from the Area Resource File (February 1996 edition) — a compilation of health-related data that have been abstracted from multiple data sources by the Bureau of Health Professions, Department of Health and Human Services. The three variables that were used to create the index were abstracted from the 1990 Census of Population and Housing, STF3A data files. The Index of Economic Resources was based on three dimensions of the local socioeconomic infrastructure: *median family income, occupational structure,* and *unemployment rate*. Occupational structure was defined as the percent of all employed persons who were engaged in white collar jobs (i.e. managerial and professional specialty occupations and technical, sales, and administrative support jobs).

The index was calculated by ranking all counties separately for each variable. For each variable, the counties were then categorized into deciles, and each decile was assigned a score ranging from 0 to 9. Counties in the decile with the poorest economic conditions (lowest median income, lowest occupational structure, highest unemployment rate) were assigned a 0 and

counties in the decile with the most advantaged economic conditions were assigned a 9. For each county, the scores from the three variables were added together to arrive at the index score. The range of the score is from 0 (counties that were in the lowest decile for all three dimensions of the Index) to 27 (counties that were in the top decile for all three dimensions of the Index). The distribution of index values across all counties was then divided into five groups with roughly equal ranges of index values.

2. Heart Disease Mortality Data

Death certificate data for the years 1991-1995 were obtained through the National Vital Statistics System maintained by the National Center for Health Statistics. Deaths from heart disease were defined as those for which the underlying cause of death listed on the death certificate was coded according to the International Classification of Diseases - 9th Revision (ICD-9) as: 390-398, 402, 404-429. These codes comprise the category 'Diseases of the Heart' as defined by the National Center for Health Statistics.[1] For each decedent, underlying cause of death, age, race/ethnicity, gender, and county of residence at the time of death were abstracted from computerized death certificate files. Information on Hispanic ethnicity was not collected on death certificates in Oklahoma throughout the 1991-1995 study period, and prior to 1993 was not collected for New Hampshire. Consequently, we could not analyze decedents of Hispanic ethnicity for Oklahoma and New Hampshire.

3. Medical Care Resources Data

Data on medical care resources were obtained from the Area Resource File, (February 1996 edition) a compilation of health-related data abstracted from multiple data sources by the Bureau of Health Professions, Department of Health and Human Services. Maps were created for the following indicators of medical care resources relevant to secondary prevention of heart disease mortality: *population per cardiovascular disease specialty physician, population per coronary care unit bed,* and *number of cardiac rehabilitation units.* The primary source for the data on cardiovascular disease physicians was the American Medical Association Physician Master File. The primary source for the data on coronary care unit beds and cardiac rehabilitation units was the County Hospital File for 1993.

Rather than map the number of physicians per county, we chose to map the ratio of county population size to each cardiovascular specialty physician. This approach provides a better comparative measure of the availability of physicians when examining counties with large populations vs. counties with small populations. Similarly, we chose to map the ratio of county population size to each coronary care unit bed. Because cardiac rehabilitation units are intended to serve more than one individual at a time, we mapped the total number of cardiac rehabilitation units in each county.

4. Population Data

Population count data for all counties in the U.S. were obtained from the Bureau of the Census for the years 1991-1995. These intercensal estimates were calculated by the Bureau of the Census through extrapolation of linear trends in population growth and inter-county migration patterns between census years 1980 and 1990.

C. Map Projections

1. National Maps

To facilitate the presentation of information for all U.S. counties, several different map projections were used. For the coterminous United States an Albers-Conic Equal Area projection was used. Alaska was projected to the Miller Cylindrical projection and Hawaii is presented using geographic coordinates (latitude and longitude). Neither Alaska nor Hawaii is to proper geographic scale relative to the continental United States. The combinations of projections and scales allowed the presentation of a relatively familiar orientation of these geographic features.

The coordinate information for the contiguous United States was projected using the Albers Equal-Area projection with the following parameters:

Spheroid: Clarke 1866	1st Standard Parallel: 29.500	False Easting: 0.000
Central Meridian: -96.000	2nd Standard Parallel: 45.500	False Northing: 0.000
Reference Latitude: 37.500		

The coordinate information for Alaska has been projected using the Miller Cylindrical project with the following parameters:

Spheroid: Sphere Central Meridian: 0.000

2. State Maps

All state maps were projected using the State-Plane projection systems of each state. The state maps are presented to maximize the reader's ability to interpret results for each state and are therefore not to proper geographic scale relative to one another. However, State-Plane coordinate systems are commonly used by state agencies and therefore their use here maximizes the reader's ability to compare these maps with other information.

Many states did not have significant populations of men of particular racial and ethnic groups. In many cases racial and ethnic specific rates could not be calculated for any of the counties within the state. Rather than present blank maps for these states, we elected to generate race and ethnicity-specific state maps only if there were at least two counties with heart disease mortality rates for any given racial and ethnic group.

D. Race and Ethnicity Definitions

The race and ethnicity categories used in *Men and Heart Disease* were defined according to Office of Management and Budget, Directive 15,[2] and are not based upon biological or anthropological concepts. The categories were developed in response to needs for collecting standardized data to be used by federal agencies for record keeping, collection and presentation of data (i.e., Federal surveys, the decennial census and monitoring various civil rights laws).

According to the Office of Management and Budget, the federal agency that defines standards for government publications, there are six minimum categories for race and ethnicity classification (listed below). Hispanic or Latino is considered a designation of ethnicity, not race, and people of Hispanic or Latino origin may be of any race.

- ***American Indian or Alaska Native***. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.
- ***Asian or Pacific Islander***. A person having origins in: a) any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam or b) a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
- ***Black or African American***. A person having origins in any of the black racial groups of Africa.
- ***Hispanic or Latino***. A person of Cuban, Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.
- ***Native Hawaiian or Other Pacific Islander***. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
- ***White***. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

E. Spatial Geometry

The geographic database, which includes spatial geometry and attribute information for all U.S. counties, was obtained from Environmental Systems Research Institute's (ESRI) ArcUSA database. ESRI has modified source data from the 1973 Digital Line Graph (DLG) data produced by the U.S. Geological Survey to improve the currency of the county boundary information to 1988. The geographic scale of the spatial geometry (linework) is 1:2,000,000, and is sufficient to identify major county features. Mortality, population, socioeconomic, and medical resource data were linked to county geography using the Federal Information Processing Standards (FIPS) codes.

F. Spatial Smoothing of Heart Disease Death Rates

1. Spatial Smoothing Methods

Heart disease death rates were calculated for men 35 years and older for the period 1991-1995. Separate rates were calculated for the following population groups: all men, American Indian and Alaska Native men, Asian and Pacific Islander men, black men, Hispanic men, and white men. For each population group, a smoothed death rate for heart disease, based on a spatial moving average, was calculated for each county.

For each county, heart disease deaths (numerators) and population counts (denominators) for ten-year age groups (e.g. 35-44 years old, 45-54 years old, etc.) were summed for the five-year study period 1991-1995. County numerators and denominators were then summed together with death count numerators and population count denominators of all neighboring counties, and then divided by the number of neighbors plus one to produce an average rate. "Neighbors" were defined based solely on contiguity (as opposed to distance). This process produced spatially smoothed age-specific (by10-year age

group) heart disease death rates. The spatially smoothed age-specific heart disease death rates were then directly age-adjusted to the 1970 United States population, for the age range 35 years and older.

Two constraints were applied to the calculation of county-level heart disease death rates for each race and ethnicity group. For a particular population group (e.g. Latino men aged 35 years and older), a heart disease death rate was *not* calculated for any county for which the total number of deaths in that county plus its neighbors was fewer than 20 during 1991-1995. To avoid calculating rates for counties that had no population themselves but whose neighbors had significant populations, rates were calculated only for counties that had a population count of 5 or greater for 1991-1995 (i.e. had 5 or greater person-years).

Information on Hispanic ethnicity was not collected on death certificates in Oklahoma throughout the 1991-1995 study period, and prior to 1993 was not collected for New Hampshire. Consequently, we removed all counties in Oklahoma and New Hampshire from the contiguity matrix when the rates for Latinos were spatially smoothed, and no rates for Hispanics in Oklahoma and New Hampshire were calculated.

1970 U.S. Population Standard Weights

Age group	Weight
0-1	.017151
1-4	.067265
5-14	.200508
15-24	.174406
25-34	.122569
35-44	.113614
45-54	.114265
55-64	.091480
65-74	.061195
75-84	.030112
85+	.007435

2. Standard Population Weights

Age-specific heart disease death rates were directly age-adjusted using the 1970 U.S. population as the standard. The 1970 standard weights were based on the total resident population in the United States as of April 1, 1970.

Because we generated heart disease death rates only for men ages 35 and over, and weights used in the age-adjustment of mortality rates are required to sum to 1, the weights for 10-year age groups for ages 35 and over were recalculated from the 1970 standard weights. The 1970 standard weights were summed for age groups 35-44 through ages 85+. New weights for each of these age groups were calculated by dividing the original weight by the sum of the weights for ages 35 and older (i.e. .418101). The new weights were rounded to two decimal places for subsequent calculation of age-adjusted heart disease death rates.

1970 U.S. Population Standard Weights
Age groups 35 and older

Age group	Weight
35-44	.27
45-54	.27
55-64	.22
65-74	.15
75-84	.07
85+	.02

3. Hispanic Population in New York City

During 1991-1993, information on Hispanic origin was not reported on approximately 22 percent of heart disease death certificates for men aged 35 years and older residing in New York City. During 1994-1995, the percent of death certificates for men that were missing information on Hispanic origin dropped to less than 3 percent. Based on a detailed examination of the New York City death certificate data for our five-year study period, we concluded that the majority of the deaths with "unknown" Hispanic origin occurred among non-Hispanic men. As evident in the table on the next page, the percent of heart disease deaths for Hispanic men rose only slightly between 1991-1993 and 1994-1995, while the percent of heart disease deaths for non-Hispanic men rose markedly after reporting improved in 1994. From 1991-1993 to 1994-1995, the average annual number of heart disease deaths increased 7 percent for Hispanic men and 22 percent for non-Hispanic men, while the number of deaths with unknown Hispanic origin declined 96 percent.

However, since a small proportion of the deaths with missing Hispanic origin data did occur among Hispanic men, it is almost certain that the heart disease death rates reported here for Hispanic men are modestly (but not severely) underestimated. In addition, the extent of underestimation may have varied among the five city boroughs; therefore prudence should be exercised in comparing individual county rates.

Percent Distribution of Heart Disease Deaths by Hispanic Origin for Men in New York City, 1991-1995

Hispanic Origin	1991	1992	1993	1994	1995
Non-Hispanic	71.2	68.1	68.8	86.5	87.8
Hispanic	7.9	7.8	7.9	9.4	8.8
Unknown	21.0	24.1	23.3	4.1	3.5

4. Contiguity Matrix for Alaska

A contiguity matrix for all U.S. counties was obtained from the 1996 Area Resource File (ARF). The matrix identifies a maximum of fourteen contiguous neighbors for every U.S. county. Because Alaska was treated as a single geographic unit in the ARF, we created our own contiguity matrix for Alaska (shown below). Columns n1-n9 identify contiguous neighbors to each county. Counties are identified by FIPS code.

County	n1	n2	n3	n4	n5	n6	n7	n8	n9
2010	2164	0	0	0	0	0	0	0	0
2020	2170	2261	2122	0	0	0	0	0	0
2050	2070	2270	2170	2164	2290	2122	0	0	0
2060	2164	2070	0	0	0	0	0	0	0
2070	2164	2060	2050	0	0	0	0	0	0
2090	2290	2240	0	0	0	0	0	0	0
2100	2231	2110	0	0	0	0	0	0	0
2110	2100	2280	0	0	0	0	0	0	0
2122	2020	2170	2050	2164	2150	2261	0	0	0
2130	2201	2280	0	0	0	0	0	0	0
2150	2122	2164	0	0	0	0	0	0	0
2164	2060	2070	2050	2122	2010	0	0	0	0
2170	2290	2240	2261	2020	2050	2122	0	0	0
2180	2270	2290	2188	0	0	0	0	0	0
2185	2188	2290	0	0	0	0	0	0	0
2188	2185	2290	2180	0	0	0	0	0	0
2201	2280	2130	0	0	0	0	0	0	0
2220	2231	2280	0	0	0	0	0	0	0
2231	2261	2100	2220	2110	2280	0	0	0	0
2240	2290	2090	2170	2261	0	0	0	0	0
2261	2240	2170	2020	2231	2122	0	0	0	0
2270	2290	2050	2180	0	0	0	0	0	0
2280	2220	2201	2231	2130	0	0	0	0	0
2290	2185	2188	2270	2050	2170	2240	2090	2180	0

G. References

[1] National Center for Health Statistics. *Public Use Data Tape Documentation, Mortality Detail, 1992.* Rockland, MD: National Center for Health Statistics, 1992.

[2] Wallman KK, Hodgdon J. Race and ethnic standards for federal statistics and administrative reporting. *Statistical Reporter*, July 1977 (no. 77-10):450-54.